Jan. 3, 1933. C. D. McDONALD 1,893,428

APPARATUS FOR AUTOMATICALLY STOPPING AUTOMATIC POWER PRESSES

Filed Feb. 18, 1929 2 Sheets-Sheet 1

Fig. 1.

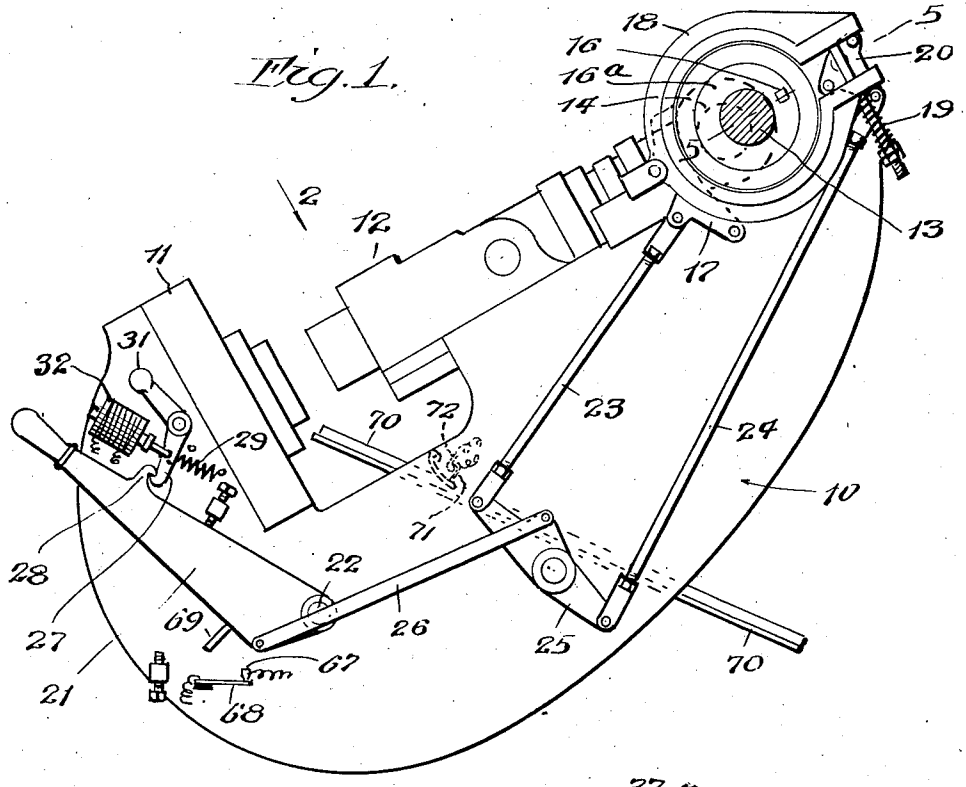
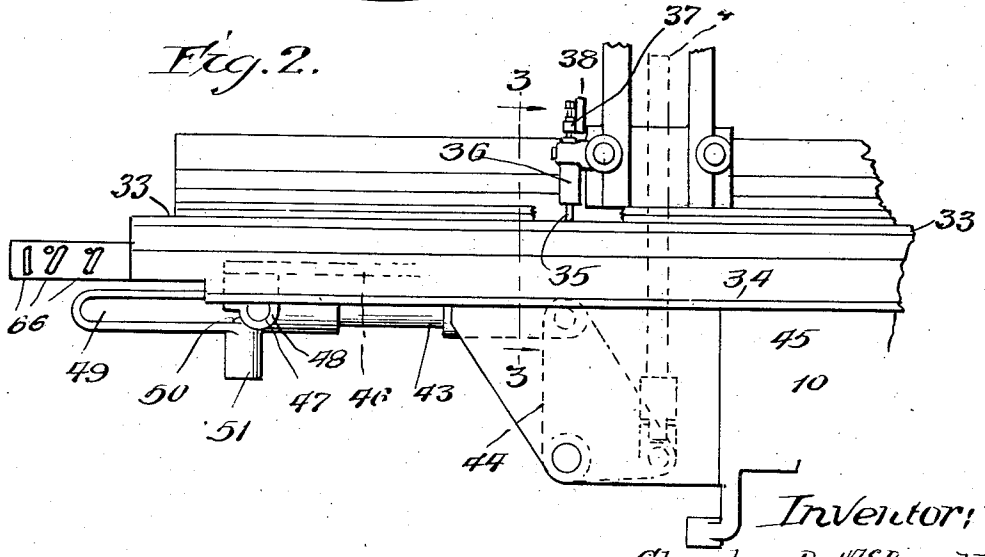


Fig. 2.



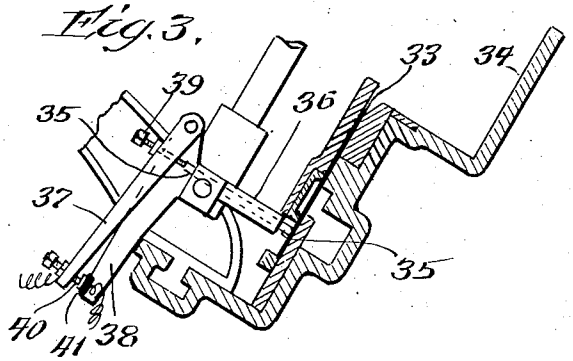
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APPARATUS FOR AUTOMATICALLY STOPPING AUTOMATIC POWER PRESSES

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Fig. 3.



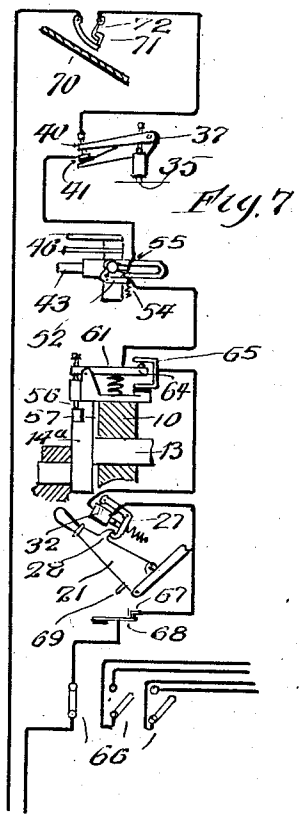
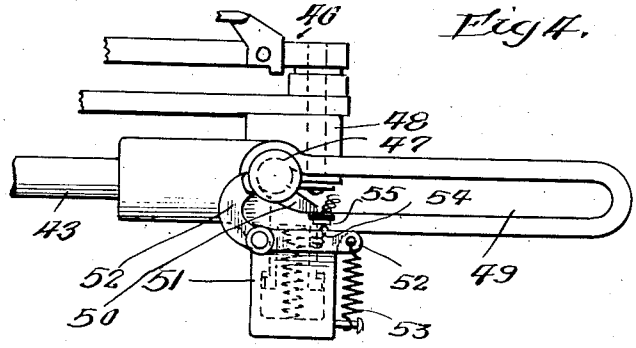


Fig. 7.

Fig. 4.



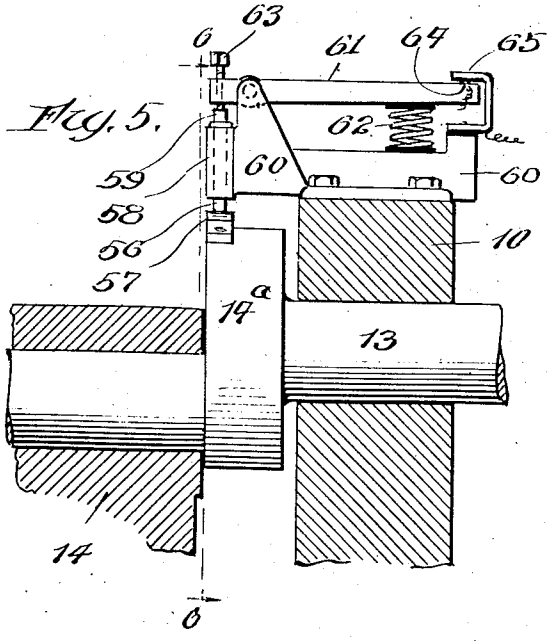


Fig. 5.

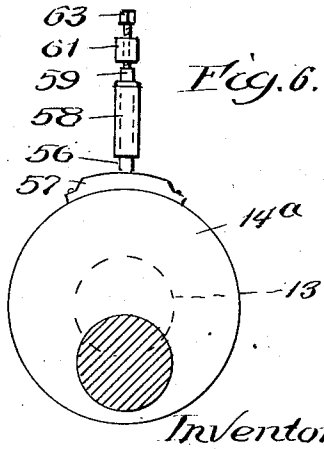


Fig. 6.

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Patented Jan. 3, 1933 1,893,428

UNITED STATES PATENT OFFICE

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APPARATUS FOR AUTOMATICALLY STOPPING AUTOMATIC POWER PRESSES

Application filed February 18, 1929. Serial No. 340,780.

This invention relates to apparatus for automatically stopping automatic power presses, and its principal object is to provide spring actuated mechanical means for holding the starting lever of the press in starting position in connection with electrically operated mechanism contained in a closed circuit and embodying a magnet or solenoid for releasing the spring actuated lever holding means thereby permitting the starting lever to fall by gravity to thereby automatically stop the press in case an emergency arises or whenever it is desired to intentionally stop the press.

Most automatic power presses are entirely automatic in operation. In the type of press to which the present invention has been applied, automatic mechanism is employed for inserting strips of material, one at a time, from a stack of strips into the feedway of the press. Automatic mechanism is employed for feeding the inserted strips in a step by step movement through the feedway and delivering them to the dies where the strips are operated upon and the desired articles blanked out therefrom or other operations performed upon the strips.

Occasionally more than one strip of material is accidentally inserted into the feedway which makes it necessary to immediately stop the press. Occasionally a jam occurs in the feedway, as, for instance, one of the strips becomes buckled therein which makes it necessary to instantly stop the press. Occasionally some of the blanked out pieces pile up on each other between the dies, or in the discharge chute, which makes it necessary to instantly stop the press. Unless the press is stopped under any of these abnormal conditions, there is a loss of the material and there is a possibility of serious injury to the press mechanism. Sometimes several presses are employed in a battery, and often the attendant desires to stop any of the presses from his present station. In accordance with the present invention, as soon as any of the abnormal conditions mentioned arise, or in case it is desired to intentionally stop any press of the battery, the circuit for the electromagnet, solenoid or other electrically operated device is broken, and the latter is thereby deenergized, thereby releasing the lever holding means and permitting its spring to disconnect it from the starting lever thereby permitting the latter to swing down and stop the press.

The invention, therefore, consists in spring actuated mechanical means for holding the starting lever of the press in starting position in connection with an electrically operated device for said lever holding means, and contained in a normally closed electric circuit and having electric connections leading to one or all of the mechanisms referred to, whereby in case an emergency occurs in any of said mechanisms which produces an abnormal condition, or in case it is intentionally desired to stop a press, the circuit to the electric device is broken and the starting lever is, as a consequence, released from the lever holding means and permitted to swing down, thereby applying the usual brake and releasing the usual clutch mechanism of the press and instantly stopping the same. The invention further consists in the several novel features hereinafter fully set forth and claimed.

The invention is clearly illustrated in the drawings accompanying this specification in which—

Figure 1 is a side elevation of an automatic power press stripped of much of its operating mechanism and showing a simple form of the present invention applied thereto;

Fig. 2 is a view of the press seen in Fig. 1 looking in the direction of the arrow 2, and illustrating the feed table and mechanism connected therewith;

Fig. 3 is a vertical cross section taken on the line 3—3 of Fig. 2;

Fig. 4 is a fragmentary rear elevation of the strip feeding mechanism;

Fig. 5 is a detail cross section taken on the line 5—5 of Fig. 1 of the crank shaft of the press;

Fig. 6 is a detail vertical cross section taken on the line 6—6 of Fig. 5; and

Fig. 7 is a diagrammatic view of the electric circuits.

Referring to said drawings, and first to

Fig. 1, the frame or body of the press will be seen at 10 and, in accordance with the common practice, has a bed 11 for holding the stationary dies and a ram 12 for holding the companion movable dies, the ram being operated from a crank shaft 13 by cranks, a fragment of one of which is shown at 14ª in Fig. 5. The invention is illustrated in connection with automatic power presses of the type containing clutch and brake mechanism for controlling the operation of the press, strip inserting mechanism, strip feed mechanism and drive mechanism, as is more fully shown and described in my prior patents, examples of which are as follows: Letters Patent No. 1,252,278, dated January 1, 1918, and No. 1,529,031, dated March 10, 1925.

Usually a drive wheel (not shown) is provided for driving the crank shaft 13, and clutch mechanism is provided between the drive wheel and crank shaft which embodies a brake drum 16ª on the crank shaft, a clutch pin 16 engaging in said brake drum and drive wheel, and a clutch shoe 17, which clutch shoe operates to retract the pin when brought into engagement therewith and thereby disconnect the drive wheel from the crank shaft. Brake mechanism 18 is employed for applying a braking action on the brake drum of the crank shaft, and the brake shoes of the brake mechanism are pressed upon the brake drum by a spring 19 as usual. A brake shoe spreader 20 is usually employed between the two brake shoes to spread them apart when it is desired to release the brakes.

The clutch and brake mechanisms are operated by a starting lever 21 fulcrumed on the side of the press body, as at 22, and the connecting mechanism between the clutch and brake mechanism and the starting lever usually comprises links 23 and 24 connected respectively to the clutch and brake mechanism and connected to a rocking lever 25 fulcrumed on the side of the press body and connected to the starting lever 24 by a link 26. The arrangement of the parts described is such that when the starting lever occupies the position seen in Fig. 1, the clutch pin has been released from a retracted position, thereby connecting the drive wheel with the crank shaft, and the brake shoes of the brake mechanism have been spread apart so as to release the brake drum, thereby permitting the press to operate. The press is stopped by swinging down the starting lever 21, and in accordance with the present invention, said starting lever is retained in its starting position by a mechanical device held in operative position by an electromagnet or solenoid contained in a closed circuit, which lever, when released from said device and permitted to fall, swings down under the influence of gravity, thereby actuating the clutch and brake mechanism in a direction to retract the clutch pin and apply the brake.

The simple means illustrated for holding the starting lever in starting position comprises a latch device of some form, as, for instance, a hook member 27 fulcrumed on the press body and arranged to engage with the starting lever or a coacting hook member 28 thereon. Located adjacent the hook member 27 is an electromagnet, solenoid or similar electric device 32 which operates, when energized, to hold the hook member in engagement with the starting lever. A spring 29 connected to the hook member and to the press body, is provided for disconnecting the hook member from the starting lever whenever the electromagnet, solenoid or other electric device 32 is deenergized. A knob or handle 31 is provided on the latch device 27 whereby it may be manually operated to disconnect it from the starting lever whenever it is intentionally desired to stop the press. The electrically operated holding means for the latch device will now be described.

The electromagnet or solenoid 32 is contained in a normally closed electric circuit, as seen in Fig. 7, and the circuit is arranged to be broken at any of the several places on the press which are likely to be placed under abnormal conditions. The circuit is also arranged to be broken by a switch located at a convenient place on the press or one located upon an adjacent press whereby any press of a battery of presses may be stopped by a person standing at any one of the presses.

Referring now to Figs. 2 and 3, the usual feedway, through which the strips of material are fed to the dies, is seen at 33, and, as is well understood, the strips of material are fed from a stack of strips held upon a table 34 and inserted into said feedway by automatically operating strip inserting mechanism. Entering said feedway 33 is a push pin or plunger 35 which is guided in a sleeve-like guide member 36 mounted upon the framework of the press and arranged to engage with a throw amplifying lever 37 fulcrumed at one end upon a bracket 38 which usually forms part of the guide member 36 for the push pin or plunger 35. Usually an adjustment screw 39 is provided upon the throw amplifying lever 37 for engagement with the push pin or plunger 35. Said lever 37 is arranged to break the circuit through the electromagnet or solenoid 32 whenever the pin or plunger 35 is lifted a greater distance than that which it is lifted when a single strip of material contacts with the pin in the feedway.

Contact pieces 40 and 41 are provided on the lever 37 and supporting bracket 38, respectively, which form terminals in the electric circuit for the electromagnet or solenoid 32 (see Fig. 7). It will be observed that the contact pieces 40 and 41 are normally held

in contact and that when more than one thickness of material is inserted into the feedway the push pin or plunger 35 will be lifted slightly beyond that caused by the insertion of one thickness of material, and this motion will be transmitted through the throw amplifying lever 37 to the contact piece 40 which will be moved out of contact with the contact piece 41 and the circuit through the solenoid or electromagnet will thereby be broken, whereby the latter is deenergized, the hook member 27 released by the solenoid or magnet and disengaged from the starting lever by the spring and the starting lever permitted to swing down thereby stopping the press.

As is well understood, the mechanism which feeds the strips through the feedway is reciprocated by finger bar mechanism 46, actuated by certain operating mechanism of the press usually including a connecting rod 43, one end of which is connected to a bell crank lever 44, which receives a rocking motion from a link 45 operated by the press mechanism. The connecting rod is connected to the finger bar mechanism 46 by a pin or stud 47, which projects from a member 48 of the finger bar mechanism and enters a slot 49 in the connecting rod whereby the connecting rod may reciprocate independently of the finger bar mechanism in case a jam occurs in the feedway.

As shown, the pin 47 projects through the slot 49 of the connecting rod and is releasably held in an offset portion at one end thereof by an upwardly spring pressed pin 50 slidably mounted in a housing 51, which is formed on the bottom of the connecting rod. The upper end of the spring pressed pin 50 engages with the rounded lower side of the connecting pin 47. During normal conditions, the spring pressed pin 50 holds the connecting pin 47 in the offset end of the end of the slot 49, but in case a jam occurs in the feedway, the resistance to the finger bar mechanism and connecting pin 47 is sufficient to overcome the pressure of the spring back of the pin 50 whereupon, as the connecting rod starts to move relative to the finger bar mechanism and connecting pin 47, the spring pressed pin is depressed by the connecting pin 47, thereby permitting the connecting rod to move independently of the finger bar mechanism.

Means is provided in connection with the connecting rod and finger bar mechanism for breaking the circuit through the solenoid or electromagnet whenever the connection between the connecting pin 47 and connecting rod 43 is broken, and, as shown, said means comprises a lever 52 fulcrumed upon the housing 51 and held in engagement with a connecting pin 47 by a spring 53. Contact pieces 54 and 55 are provided on said lever 52 and connecting rod 43 respectively, which contact pieces comprise terminals in the solenoid or electromagnet circuit and are normally held in contact. In case of a jam in the feedway, however, and the connecting pin 47 being thereby disconnected from the connecting rod 43, the lever 52 becomes disengaged from the connecting pin and the spring 53 swings down the long arm of the lever 52 thereby moving the contact piece 54 out of contact with the contact piece 55 and thereby breaking the circuit through the solenoid or electromagnet causing the starting lever to be released and permitting it to swing down and stop the press as before described.

In cases where two or more blanked out pieces lodge upon each other between the dies, a strain is placed upon the crank shaft and other parts, which is likely to cause serious injury. In order to automatically stop the press in the case of such emergency, I provide a push pin or plunger 56 above the cheek 14^a of the crank shaft and provide a cam block 57 on the cheek, which is arranged to normally pass by said push pin 56 without moving it, but which is arranged to engage said push pin and lift the same in case a strain is placed upon the crank shaft, such as is occasioned by the presence of two or more blanked out pieces piling up on each other between the dies. The push pin 56 is guided in a guide member 58 and has a head 59 resting on the top thereof, which supports the push pin in position permitting the cam block 57 to pass idly by the same under normal working conditions between the dies. The guide member 58 is formed upon a bracket 60 bolted or otherwise secured to the press body 10 and on said bracket is fulcrumed a throw amplifying lever 61, the short end of which is held in contact with the push pin, as, for instance, by a coiled spring 62. As a preference, an adjustment screw 63 is employed in the short arm of the throw amplifying lever 61 for engagement with the push pin 56.

Contact pieces 64 and 65 are provided upon the throw amplifying lever 61 and some stationary piece, such as the bracket 60, which contact pieces are normally held in contact, but which are arranged to be separated whenever the crank shaft is forced upward under abnormal conditions between the dies, and the cam block 57 is brought into lifting engagement with the push pin 56. The contact pieces 64 and 65 form terminals in the electric circuit for the solenoid or electromagnet 32, which circuit when broken as a result of the separation of the contact pieces 64 and 65, permits the solenoid or electromagnet to be deenergized thereby releasing the hook member which releases the starting lever and permits it to fall, stopping the press as heretofore explained.

As is customary, the supports carrying the bearings for the crank shaft are spaced a con-

siderable distance apart. In each bearing, there is a clearance of about .003 of an inch. Under normal operations of the press on a single thickness of material, the shaft will be raised in its bearing to take up the clearance, but will be flexed very little, and the cheek 14ª will not be raised sufficient to bring about a breaking of the contacts 64 and 65. When the machine is operating under overload, as for example, when operating on two sheets of material, then the reaction on the crank will flex the crank shaft, changing slightly the angular position of the sections of the shaft in its bearings, and flexing the central portion of the crank, which causes the cheek 14ª to raise to its normal position and operate through the lever 61 to break the contacts 64 and 65. This will break the circuit so as to de-energize the solenoid or magnetic device 32 and stop the machine.

The blanked out pieces fall upon a chute 70 and are discharged by said chute as is well understood. Sometimes the pieces fail to discharge from the chute and pile up therein and the press must be stopped. I have provided a movable contact piece 71 and a stationary contact piece 72 above the chute, which contact pieces are contained in the circuit of the solenoid or magnet device 32. Normally the contact pieces 71 and 72 are in contact and spaced sufficiently above the chute to permit the blanked out pieces to pass by freely. When however, the pieces pile up in the chute and move the movable contact piece 71 out of contact with the stationary contact piece 72, the circuit is broken, the magnet deenergized and the latch device disconnected from the starting lever as before, thereby permitting it to fall and stop the press.

Any one of the devices described automatically stops the press in case of an emergency taking place in or about the mechanisms above described. In situations where a battery of presses containing two or more presses are used, switches 66 may be provided at some convenient place on each press, which switches may be in electric circuits running to the solenoids or electromagnets of the several presses, whereby any press of the battery may be stopped instantaneously by an attendant at any one of the presses by opening the switch for the selected press and breaking the circuit to the magnet 32 of that press.

Inasmuch as the contact pieces of any automatic circuit breaking device described are necessarily closed before the press is again started, I have provided a switch or other circuit breaking device for the solenoid or magnet circuit and located below the starting lever 21, and arranged to be operated whenever the starting lever is permitted to fall to its position wherein it stops the press, whereby the circuit will remain open until the press is again started. As shown in Fig. 1, this device may comprise a stationary contact piece 67 and a movable spring pressed contact piece 68 normally held in contact with the stationary contact piece and lying in the path of movement of the starting lever or a lug or other projection 69 thereon. When the starting lever is lowered, the pin or other projection 69 engages the movable contact piece 68 and moves it out of contact with the stationary contact piece, thereby breaking the circuit to the solenoid or electromagnet.

The electric circuit for the several instruments is diagrammatically illustrated in Fig. 7, where it will be seen that if contact is broken between any of the closed contact points, the circuit through the solenoid or electromagnet will be broken, whereby the solenoid or magnet will be deenergized and the hook member 27 released and disconnected from the starting lever, whereby the starting lever is permitted to swing down and stop the press. As soon as the starting lever strikes the contact piece 68, it breaks the electromagnet circuit at that point also. The attendant thereupon removes the material which caused the press to be stopped, which permits the separated contact pieces to come together again, and he then lifts the starting lever into starting position in engagement with the hook member 27 which is now held in position for engagement with the starting lever by the solenoid or magnet, since the magnet circuit becomes closed upon the lifting of the starting lever.

It will be observed that the latch device 27 operates to positively hold the starting lever 21 in operative position and that it may be manually operated against the action of the solenoid to disconnect it from the starting lever to permit the latter to swing down and stop the press. Furthermore, that the electrically operated mechanism is in a normally closed circuit which is broken automatically when an emergency occurs or when it is broken intentionally by an attendant throwing the switch 66. The only purpose of the electromagnet, solenoid, or other electrical device 32 is to hold the latch device in engagement with the starting lever so as to prevent it from falling. Furthermore, the circuit is broken by the starting lever immediately when the lever has fallen to stopping position, and the circuit cannot be closed until after the starting lever has been raised into starting position.

More or less variation of the exact details of construction is possible without departing from the spirit of this invention. I desire, therefore, not to limit myself to the exact form of the construction shown and described, but intend, in the following claims, to point out all of the invention disclosed herein.

I claim as new, and desire to secure by Letters Patent:

1. An automatic power press including in

combination a manually operable clutch shifting starting lever movable automatically from its starting position to stopping position, a latch means for holding said lever in starting position, a spring associated with said latch means for releasing the same from said lever, a manually operated member associated with said latch means whereby the same may be released from the lever for stopping the machine and an electro-magnet associated with said latch means and operating when energized for moving the latch against the action of the spring into position for engagement with a starting lever, said spring operating to release the latch means when said magnet is deenergized for stopping the machine, and a circuit breaking means for the circuit of said electro-magnet.

2. An automatic power press including in combination a manually operable clutch shifting starting lever movable automatically from its starting position to stopping position, a latch means for holding said lever in starting position, a spring associated with said latch means for releasing the same from said lever, a manually operated member associated with said latch means whereby the same may be released from the lever for stopping the machine and an electro-magnet associated with said latch means and operating when energized for moving the latch against the action of the spring into position for engagement with a starting lever, said spring operating to release the latch means when said magnet is de-energized for stopping the machine, and a circuit breaking means for the circuit of said electro-magnet, said circuit breaking means including a throw amplifying contact lever for breaking the circuit when an abnormal condition arises in that part of the press in which the circuit breaking means is contained.

CHARLES D. McDONALD.